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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/919,943	08/02/2001	John Clayton Foster	52352-757	5290

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EXAMINER	
TOLEDO, FERNANDO L	
ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 10/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/919,943	FOSTER ET AL.	
	Examiner	Art Unit	
	Fernando Toledo	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

P riod for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 August 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6,7 and 9-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6,7 and 9-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Allowable Subject Matter

1. The indicated allowability of claim 2 is withdrawn in view of the newly discovered reference(s) to Ohmori (U. S. patent 6,586,345 B1. Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 3, 4, 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woo et al. (U. S. patent 6,507,123 B1).

In re claim 1, Woo in the U. S. patent 6,507,123 B1; figures 1A – 3K, and related text discloses proving a semiconductor substrate 10 having a horizontal surface; forming source and drain regions 30 and 32 in the surface of the substrate; forming a gate electrode 24 on the horizontal surface of the substrate between the source and drain regions, the gate electrode having a horizontal top surface and sidewalls; providing silicon nitride spacers 36 and 38 on the sidewalls of the gate electrode; depositing a layer of silicon oxide 37 having a thickness of between 20 and 40 Å and the horizontal surface of the semiconductor substrate and the horizontal top surface of the gate electrode; removing the silicon oxide layer over the horizontal

surface of the semiconductor substrate and the horizontal top surface of the gate electrode (Figure 3H); depositing nickel 46 on the horizontal top surface of the gate and the horizontal surface of the substrate; annealing to react the nickel with silicon in the horizontal top surface of the gate electrode and in the horizontal surface of the substrate to form a metal silicide 48 on the horizontal surfaces.

Woo teaches that the thin oxide film is at the greatest thickness 50 Å.

Woo does not teach wherein the thickness of the thin oxide film is between 20 and 40 Å.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the thickness of Woo at between 20 to 40 Å, since although the ranges do not overlap they are close enough to have the same properties (See MPEP §2144.05). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the thickness of Woo at between 20 to 40 Å, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,* 105 USPQ 233. Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses are critical. *In re Woodruf,* 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

4. In re claim 3, Woo teaches wherein the gate dielectric 16 is a dielectric selected from the group consisting of silicon dioxide, silicon nitride or a high-K dielectric (Column 7, Line 19).

5. In re claim 4, Woo discloses that the oxide layer is 20Å thick (Column 8, Lines 35 – 37).

6. In re claim 6, Woo discloses wherein the silicon oxide is removed using anisotropic sputter etching (column 8, lines 30 – 35).

7. In re claim 7, Woo discloses including the further step of removing the unreacted nickel (Column 9, Lines 10 - 19).

8. Claims 2 and 9 – 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woo as applied to claims 1, 3, 4, 6 and 7 above, and further in view of Ohmori (U. S. patent 6,586,345 B1).

In re claim 2, Woo does not disclose wherein the silicon oxide is formed by treating the substrate in a mixture of sulfuric acid and hydrogen peroxide.

However, Ohmori, in the U. S. patent 6,586,345 B1; figures 1(a) – 9(c) and related text, discloses, forming a silicon oxide layer on a wafer using a mixture of sulfuric acid and hydrogen peroxide, since it produces an even and clean chemical oxide (Column 4, Lines 25 – 53).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to form a silicon oxide by treating the substrate in a mixture of sulfuric acid and hydrogen peroxide in the invention of Woo, since, according to Ohmori, it produces an even and clean chemical oxide.

9. In re claim 9, Woo discloses proving a semiconductor substrate 10 having a horizontal surface; forming source and drain regions 30 and 32 in the surface of the substrate; forming a gate electrode 24 on the horizontal surface of the substrate between the source and drain regions, the gate electrode having a horizontal top surface and sidewalls; providing silicon nitride spacers 36 and 38 on the sidewalls of the gate electrode; depositing a layer of silicon oxide 37 having a

thickness of between 20 and 40 Å and the horizontal surface of the semiconductor substrate and the horizontal top surface of the gate electrode; removing the silicon oxide layer over the horizontal surface of the semiconductor substrate and the horizontal top surface of the gate electrode (Figure 3H); depositing nickel 46 on the horizontal top surface of the gate and the horizontal surface of the substrate; annealing to react the nickel with silicon in the horizontal top surface of the gate electrode and in the horizontal surface of the substrate to form a metal silicide 48 on the horizontal surfaces.

Woo teaches that the thin oxide film is at the greatest thickness 50 Å.

Woo does not teach wherein the thickness of the thin oxide film is between 20 and 40 Å.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the thickness of Woo at between 20 to 40 Å, since although the ranges do not overlap they are close enough to have the same properties (See MPEP §2144.05). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the thickness of Woo at between 20 to 40 Å, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,* 105 USPQ 233. Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses are critical. *In re Woodruf*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Woo does not disclose wherein the silicon oxide is formed by treating the substrate in a mixture of sulfuric acid and hydrogen peroxide.

However, Ohmori, in the U. S. patent 6,586,345 B1; figures 1(a) – 9(e) and related text, discloses, forming a silicon oxide layer on a wafer using a mixture of sulfuric acid and hydrogen peroxide, since it produces an even and clean chemical oxide (Column 4, Lines 25 – 53).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to form a silicon oxide by treating the substrate in a mixture of sulfuric acid and hydrogen peroxide in the invention of Woo, since, according to Ohmori, it produces an even and clean chemical oxide.

10. In re claim 10, Woo teaches wherein the gate dielectric 16 is a diclectric selected from the group consisting of silicon dioxide, silicon nitride or a high-K dielectric (Column 7, Line 19).

11. In re claim 11, Woo discloses that the oxide layer is 20Å thick (Column 8, Lines 35 – 37).

12. In re claim 12, Woo discloses wherein the silicon oxide is removed using anisotropic sputter etching (column 8, lines 30 – 35).

13. In re claim 13, Woo discloses including the further step of removing the unreacted nickel (Column 9, Lines 10 – 19).

Response to Arguments

14. Applicant's arguments with respect to claims 1, 3, 4, 6 and 7 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando Toledo whose telephone number is 703-305-0567. The examiner can normally be reached on Mon-Fri 8am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

George Fourson
Primary Examiner
Art Unit 2823

F Toledo